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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/891,612	06/27/2001	Mamoru Nakasuji	010816	8832

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EXAMINER	
BERMAN, JACK I	

ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 06/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/891,612	NAKASUJI ET AL.	
	Examiner	Art Unit	
	Jack I. Berman	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 April 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *52-78,80-82,85-93 and 95-97* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *80-82,85 and 95-97* is/are allowed.

6)☒ Claim(s) *52-78 and 86-93* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 October 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 90-93 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. As was explained in the previous Office action, these claims contain subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Applicant has amended Claim 90 to claim that the controller previously claimed as controlling a retarding voltage on the basis of a unit for measuring the charge-up state of the object under test in order to determine an optimal retarding voltage now controls the beam current on the basis of that same unit to determine an optimal beam current. No such apparatus is disclosed in the original disclosure. While line 21 on page 159 of the substitute specification filed on January 5, 2004 mentions the possibility of values of optimal beam currents being found, there is no explanation of how this could be done since the unit for measuring the charge-up state disclosed in this embodiment of the invention (the eleventh embodiment and the only embodiment that discloses a unit for measuring charge-up) operates by changing the retarding voltage and monitoring the quality of the resultant images (which is inherently the measure of the performance of the performance of the apparatus, contrary to the implications of the remarks accompanying the amendment filed on October 12, 2004). How can the disclosed unit for measuring the charge-up state function if the primary beam current was not fixed? Any change in the beam current would add an extra variable into the system that the disclosed system does not take into account. In the remarks filed on April 8, 2005, the only support in the original

disclosure for the new limitation pointed to by Applicant is the discussion of CPU 1763 at page 159 of the supplemental specification:

> "When a retarding voltage is found with a satisfactory charge-up state, this value is applied to the applying unit 1750 through the CPU 1763, or if values of optimal beam currents are found, the sample or wafer is evaluated with these values."

This is the same section of the specification cited by the examiner. It constitutes only an invitation to someone reading the specification to determine an optimal beam current without teaching such a person how to make such a determination.

The remarks filed on April 8, 2005 go on to state:

> "Applicants respectfully respond that an image's quality increases as a primary current increase and a secondary current increase accordingly, but that an image's quality decreases as an increase of charge-up. As a result, an image quality has a maximum value as an increase in a primary current, because charge-up increases as an increase in the primary current. In other words the image quality has an optimum value."

Where is the support in the original disclosure for this relationship between beam current and image quality? Even given this relationship, it still does not answer the question raised by the examiner in the previous Office action, i.e., how can the disclosed unit for measuring the charge-up state function if the primary beam current was not fixed? The disclosure has still not been shown to be enabling.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 52-54, 60, and 68-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki et al. in view of Lo et al., Tabrizi et al., and Davis et al., for the reasons explained in the previous Office action, and further in view of Abe et al. In the amendment filed on April 8, 2005, one limitation was added to these claims to distinguish them from the prior art: the electro-optical system includes lens electrodes coated by metal having a large work function. As was explained in the previous Office action with respect to the rejection of Claim 56, Abe et al. discloses electrodes formed as metal films for use in an electron optical column and teaches, at lines 26-32 in column 4 that the use of platinum as the material of such metal coatings is advantageous because platinum does not react with a plasma used to clean the electron optical column so a problem with charge-up (accumulation of charge on non-conductive deposits on an electrode) does not occur. It would therefore have been obvious to a person having ordinary skill in the art to use coatings of platinum to form the required electrodes in the Yamazaki et al./Lo et al./Tabrizi et al./Davis et al. apparatus in order to avoid charge-up problems in the manner taught by Abe et al. While Abe et al. does not mention the work function of the platinum coating, this work function is an inherent property of platinum, which is defined by Applicant at pages 87-95

of the substitute specification as a metal that has a suitable work function to meet the newly claimed limitation and is specifically claimed as such in dependent Claim 56.

Claims 55 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki et al., Lo et al., Tabrizi et al., Davis et al. and Abe et al. as applied to claims 52-54, 60, and 68-78 above, and further in view of Bachman. As was explained in the previous Office action, the Yamazaki et al. apparatus has several electrostatic lenses, but these lenses are not described in detail. Bachman, on the other hand, discloses an electrostatic lens including a plurality of electrodes (18, 19) having potential differences, and an insulating material (10) positioned between said electrodes for holding said electrodes, at least one electrode (19) having a first electrode surface having a minimum inter-electrode distance, a second electrode surface having an inter-electrode distance longer than said first electrode surface, and a step between both said electrodes (18, 19); said insulating material (10) being positioned between said second electrode surface and another electrode (18) for substantially vertically supporting each electrode; and a minimum creeping distance of said insulating material between said electrodes is substantially equal to an inter-electrode distance in said supported electrode portion. It would have been obvious to a person having ordinary skill in the art to use the electrostatic lens disclosed by Bachman as at least one of the unspecified electrostatic lenses required by Yamazaki et al.

Claims 57-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki et al., Lo et al. Tabrizi et al., Davis et al. and Abe et al. as applied to claims 52-54, 60, and 68-78 above, and further in view of Watanabe et al. As was explained in the previous Office action, Watanabe et al. teaches that scanning electron microscopes face a problem caused by vibrations

because such vibrations cause the image formed to vibrate. Watanabe et al. teaches to solve this problem by providing a scanning electron microscope with a mechanical construction for determining a position of said object under testing at which a primary irradiating beam (2) is emitted, a piezoelectric element (9) for receiving a force from vibrations of said mechanical construction; and a vibration attenuating circuit (17) electrically connected to said piezoelectric element for acting to attenuate output electric energy. According to Watanabe et al., the vibration attenuating circuit drives the piezoelectric element at a resonant frequency of the mechanical construction. By definition, any circuit capable of driving a piezoelectric element at a resonant frequency must be tuned, which inherently requires that an inductive means must be determined with respect to the static capacitance of that element, and since Watanabe et al. does not provide any superconductors, the circuit must also have some resistive elements. It would have been obvious to a person having ordinary skill in the art to provide the Yamazaki et al./Lo et al./Tabrizi et al./Davis et al./Abe et al. apparatus discussed above with Watanabe et al.'s vibration attenuating means in order to avoid the vibration problems discussed by Watanabe et al.

Claims 61, 62, and 65-67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki et al., Lo et al., Tabrizi et al., Davis et al. and Abe et al. as applied to claims 52-54, 60, and 68-78 above, and further in view of Petric. As was explained in the previous Office action, Yamazaki et al. does not give any details about the stage positioning equipment and evacuation devices required for the disclosed sheet beam testing apparatus. Petric discloses a stage (30) for holding an object to be irradiated with a focused electron beam with a degree of freedom at least equal to or more than two with respect to the electron-optical system, said stage (30) comprising

a non-contact supporting mechanism by means of hydrostatic bearings (see lines 10-15 in column 8), and a vacuum sealing mechanism (20) through differential pumping, and a partition (20) containing a differential pumping structure is disposed between a location of said object which is irradiated with the beam and a hydrostatic bearing support of said stage for reducing a conductance to produce a pressure difference. At lines 56-59 in column 7, Petric teaches that the surface (9) of parts facing the hydrostatic bearing should be ground to form a flat surface, this grinding inherently constituting a surface treatment that reduces released gases because it removes pits in which gases might be trapped. It would have been obvious to a person having ordinary skill in the art to use the Petric apparatus as the stage positioning equipment and evacuation devices required for the Yamazaki et al./Lo et al./Tabrizi et al./Davis et al. sheet beam testing apparatus since the Petric apparatus is designed to permit the irradiation of objects with a focused electron beam of the type used by Yamazaki et al., Lo et al., and Davis et al. While Petric uses air as the gas supplied to the hydrostatic bearings, the use of dry nitrogen or inert gas would have been an obvious substitution of equivalent materials to exert a hydrostatic gas pressure. It would also have been obvious to a person having ordinary skill in the art to exhaust the gas supplied to the hydrostatic bearing from a housing for containing said stage, and thereafter pressurizing the gas and again supplying it to said hydrostatic bearings in order to avoid wasting the gas.

Claim 63 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki et al., Lo et al., Tabrizi et al., Davis et al., Abe et al. and Petric as applied to claims 61, 62, and 65-67 above, and further in view of Lamattina et al. As was explained in the previous Office action, Lamattina et al. teaches, at lines 8-9 in column 4, that it is known in the art to use a cold trap to

back up a roughing pump and a high vacuum pump. It would therefore have been obvious to a person having ordinary skill in the art to use such a cold trap in the differential pumping structure that forms a partition in both the Lamattina et al. apparatus (as envelope apparatus 29 and 39) and the Petric apparatus (as envelope 20 and 87) when using this structure to permit the irradiation of the object under test in the Yamazaki et al./Lo et al./Tabrizi et al./Davis et al./Abe et al./Petric apparatus discussed above.

Claim 64 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki et al., Lo et al., Tabrizi et al., Davis et al., Abe et al. and Petric as applied to claims 61, 62, and 65-67 above, and further in view of Bisschops et al. As can be best seen in Figure 4, Bisschops et al. teaches that when a hydrostatic bearing (21) is used to support a stage (14) that supports a wafer (W) inside the vacuum chamber (V) of a lithography system (2), it is advantageous to provide a partition (sliding seal plate 12) near the hydrostatic bearing to minimize loss of vacuum. Since the Petric apparatus uses a hydrostatic bearing as well as a partition near the electron beam generator, it would have been obvious to a person having ordinary skill in the art to apply the teachings of Bisschops et al. by providing an additional partition near the hydrostatic bearing if the Petric apparatus is used as the stage in the Yamazaki et al. sheet beam based testing apparatus in order to maintain the lowest pressure possible at the surface of the wafer under test.

Claims 86-89 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki et al., Lo et al., Tabrizi et al., and Davis et al. as applied to claims 52-54, 60, 68-78, and 86 above, and further in view of Livesay. As is discussed above, it would have been obvious to a person having ordinary skill in the art to use the electrostatic chuck cited by Lo et al. to both hold the object and apply the required predetermined voltage in the Yamazaki et al. apparatus.

However, Lo et al. does not specify a particular structure for the electrostatic chuck. Livesay discloses an electrostatic chuck comprising an electrode divided into a central portion (28) used to apply a low potential or ground potential to a wafer (11), see lines 3-12 in column 6, and a peripheral portion (26) to which a different potential is applied. When a wafer is placed on the chuck, the assembly forms a laminate of a substrate (wafer 11), an electrode (26) and an insulating material (dielectric sheet 25), wherein the wafer is applied with a voltage through a predetermined resistor (the resistance inherent in the contact (28) and the wiring connecting the contact to the voltage source (32)) and a contact (28), said contact (28) having a shape such that its leading end comes in contact with a back surface of said object under testing. It would have been obvious to a person having ordinary skill in the art to use Livesay's electrostatic chuck as the unspecified electrostatic chuck suggested by Lo et al. The use of some of the peripheral portion (26) of the electrode instead of Livesay's connecting arm underneath and isolated from the peripheral portion to connect the central portion (28) of the electrode to the voltage source would have been an obvious substitution of equivalent parts. In the amendment filed on October 12, 2004, Applicant attempted to distinguish over the prior art by adding the limitation that the apparatus comprises "a controller for controlling said voltage source to cause a voltage to be applied to said object to be gradually deepened to reach to a predetermined value during a predetermined period so that an insulating layer is prevented from breakdown." Applicant has presented no evidence that the Lo et al. apparatus changes the voltage so quickly that the objects under test are harmed because Lo et al. does not specify a rate at which to change the voltage. The new limitation of a controller that gradually deepens the voltage applied to the object therefore is a vague limitation that attempts to solve a problem that only exists if a person tried to

operate the Yamazaki et al./Lo et al./Tabrizi et al./Davis et al./Abe et al. apparatus in a way not taught by any of the prior art. Such a solution to a nonexistent problem cannot patentably distinguish an invention. Applicant's assertion in the remarks filed on April 8, 2005 that "none of the cited references demonstrate gradual deepening of voltage to reach a predetermined value at a predetermined time so that an insulating layer is prevented from breakdown" does nothing to establish the existence of such a problem. In view of the absence of any evidence to the contrary, it would have been obvious to a person having ordinary skill in the art to change the voltage applied to the objects under test in the Lo et al. apparatus at a rate that does not cause an insulating layer to break down.

Claims 80-82, 85, and 95-97 are allowed for the reasons explained in the previous Office action (since new claims 96 and 97 depend from previously allowed claim 85).

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jack I. Berman whose telephone number is (571) 272-2468. The examiner can normally be reached on M-F (8:30-6:00) with every second Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee can be reached on (571) 272-2477. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jack I. Berman
Primary Examiner
Art Unit 2881

jb
6/21/05